

[0128] The step for positioning may further comprise a step for translating the panels while attached to a surface of cylinder for the cylindrical abstraction.

[0129] The step for creating seams may comprise a step for classifying the seams into three categories:

[0130] intra-pack seams used for seaming seam lines belonging to a same pack;

[0131] inter-pack seams used for seaming seam lines belonging to two different packs; and

[0132] inter-layer seams consisting of T-seams and Y-seams, wherein the seam is made with an interior line in the T-seam, and multiple panels are seamed with a single contour in the Y-seam.

[0133] The inter-pack seams may be further categorised into the inter-half-cylinder seams (that join the front and back half cylinders) and the inter-cylinder seams (that join two cylinders).

[0134] The Y-seam lines may be explicitly tagged through a secondary seam line tagging by the user.

[0135] The probability whether two candidate lines in 3D are inter-pack seamed may be estimated using criteria including:

[0136]  $M_{id}$ : The distance is short;

[0137]  $M_{io}$ : The FOV of the two planar normals is small;

[0138]  $M_{ll}$ : The length should be similar;

[0139]  $M_{lc}$ : The curvature should be similar; and

[0140]  $M_{sa}$ : The lines should be seamable.

[0141] An objective function  $M(i, j)$  used for finding the matching inter-pack seam lines may be defined as

$$M(i, j) = M_{id}(i, j)M_{io}(i, j)M_{ll}(i, j)M_{lc}(i, j)M_{sa}(i, j), \text{ where} \quad (1)$$

$$M_{id}(i, j) = \frac{d_{max} - \|p_i - p_j\|}{d_{max}}, \quad (2)$$

$$M_{io}(i, j) = \frac{1 - n_i \cdot n_j}{2}, \quad (3)$$

$$M_{ll}(i, j) = \frac{L_{diff} - |L_i - L_j|}{L_{diff} K_{diff}}, \quad (4)$$

$$M_{lc}(i, j) = \frac{-|K_i - K_j|}{K_{diff}}, \quad (5)$$

$$M_{sa}(i, j) = 0 \text{ or } 1. \quad (6)$$

in which Eq. (2) represents the proximity, where  $d_{max}$  is the threshold distance (a controllable parameter),  $p_i$  and  $p_j$  are the positions of line  $i$  and  $j$ , Eq. (3) represents the orientation match, where  $n_i$ ,  $n_j$  are the planar normals of line  $i$  and  $j$ , respectively, Eq. (4) represents the length match, where  $L_{diff}$  is the threshold length difference (a controllable parameter),  $L_i$  and  $L_j$  are the lengths of line  $i$  and  $j$ , respectively, Eq. (5) represents the curvature match, where  $k_{diff}$  is the threshold curvature difference (a controllable parameter),  $\kappa_i$  and  $\kappa_j$  are the curvatures of line  $i$  and  $j$ , respectively, and Eq. (6) represents the seamability, which takes either zero or one based on the line pair's inherent and conventional unseamability.

[0142] Matching inter-cylinder seam lines may be identified by steps for:

[0143] for a particular line  $i$ , calculating the objective function value  $M(i, j)$  for all the adjacent lines  $j$  in the other cylinder to find the best individual match for  $i$ ; and

[0144] finding the best ring match by rotating the distal cylinder about the axis and calculating the circumferential summation of  $M(i, j)$ .

[0145] The embodiments are performed in at least one information processing device such as a computer. Each of the steps is related with computing in a CPU and storing and retrieving data to and from a memory, and changing the computer-readable data or information in the information processing device. And the results may be obtained in a form or format of computer- or device-readable data. Also the results may be adapted to be displayed on a computer monitors or equivalents. All the necessary data structure for representing the data or command codes are implied and well-known to the community.

## REFERENCES

- [0146] BARAFF, D., AND WITKIN, A. 1998. Large steps in cloth simulation. In *In Proc. of SIGGRAPH 98*, ACM, New York, N.Y., USA, 43-54.
- [0147] BERTHOUSOZ, F., GARG, A., KAUFMAN, D. M., GRINSPUN, E., AND AGRAWALA, M. 2013. Parsing sewing patterns into 3d garments. *ACM Transactions on Graphics* 32, 4 (July), 85:1-85:11.
- [0148] CHOI, K.-J., AND KO, H.-S. 2002. Stable but responsive cloth. In *In Proc. of ACM SIGGRAPH 02*, ACM, New York, N.Y., USA, 604-611.
- [0149] CORDIER, F., SEO, H., AND MAGNENAT-THALMANN, N. 2003. Made-to-measure technologies for an online clothing store. *IEEE Computer graphics and applications* 23, 1, 38-48.
- [0150] DECAUDIN, P., JULIUS, D., WITHER, J., BOIS-SIEUX, L., SHEFFER, A., AND CANI, M.-P. 2006. Virtual garments: A fully geometric approach for clothing design. In *Computer Graphics Forum, vol. 25*, Wiley Online Library, 625-634.
- [0151] FONTANA, M., CARUBELLI, A., RIZZI, C., AND CUGINI, U. 2005. Clothassembler: a cad module for feature-based garment pattern assembly. *Computer-Aided Design and Applications* 2, 6, 795-804.
- [0152] GRINSPUN, E., HIRANI, A. N., DESBRUN, M., AND SCHRÖDER, P. 2003. Discrete shells. In *Proceedings of the 2003 ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, Eurographics Association, Aire-la-Ville, Switzerland, Switzerland, SCA '03, 62-67.
- [0153] GUAN, P., REISS, L., HIRSHBERG, D. A., WEISS, A., AND BLACK, M. J. 2012. Drape: Dressing any person. *ACM Trans. Graph.* 31, 4 (July), 35:1-35:10.
- [0154] HARALICK, R. M., AND QUEENEY, D. 1982. Understanding engineering drawings. *Computer Graphics and Image Processing* 20, 3, 244-258.
- [0155] IGARASHI, T., AND HUGHES, J. F. 2002. Clothing manipulation. In *Proceedings of the 15th Annual ACM Symposium on User Interface Software and Technology*, ACM, New York, N.Y., USA, UIST '02, 91-100.
- [0156] MENA, J. B. 2003. State of the art on automatic road extraction for gis update: A novel classification. *Pattern Recogn. Lett.* 24, 16 (December), 3037-3058.
- [0157] MENG, Y., MOK, P. Y., AND JIN, X. 2010. Interactive virtual try-on clothing design systems. *Comput. Aided Des.* 42, 4 (April), 310-321.
- [0158] MENG, Y., MOK, P. Y., AND JIN, X. 2012. Computer aided clothing pattern design with 3d editing and pattern alteration. *Comput. Aided Des.* 44, 8 (August), 721-734.
- [0159] MENG, Y., WANG, C. C. L., AND JIN, X. 2012. Flexible shape control for automatic resizing of apparel products. *Comput. Aided Des.* 44, 1 (January), 68-76.